THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
June, 2023; 3(06), 1025-1028
Popular Article

Antibiotic Residues in Milk

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https://doi.org/10.5281/zenodo.8054390

Abstract

Antibiotic residues in milk pose a significant risk to public health, contributing to the global concern of antibiotic resistance. The indiscriminate use of antibiotics in food-producing animals and the use of certain antibiotics as feed additives without proper regulation are major factors leading to the presence of residues in milk. International organizations play a crucial role in regulating the use of antibiotics in animal production, setting maximum residue limits (MRLs) to minimize risks. Detecting and regulating antibiotic residues in milk requires the development of highly sensitive detection tools and appropriate confirmation and quantification methods. Public awareness, adherence to withdrawal periods, regular monitoring, and surveillance policies are essential in controlling antibiotic residues.

Keywords: Antibiotic residue, maximum residue limit, health risks, detection

Introduction

Antibiotics are substances that occur naturally or are created through semi-synthetic or synthetic processes, which possess antimicrobial properties. These compounds can be administered in animals via various routes, including injection, oral ingestion, or topical application. For over six decades, antibiotics have been employed in the healthcare of livestock to prevent and treat common ailments such as mastitis, respiratory infections, and foot diseases.

The global rise of antibiotic resistance has become a significant concern in the field of public health, with an estimated 0.7 million deaths attributed to this issue each year. Alarmingly, this number is projected to increase to 10 million deaths annually by 2050.

Antibiotic use in food-producing animals contributes to the presence of drug residues in products like milk, meat, and eggs, leading to the development of antimicrobial-resistant bacteria. These residues can be released into the environment and contaminate animal-derived food items. This practice not only promotes the spread of antimicrobial resistance among animals but also poses a substantial risk to human health. Additionally, the contamination of the environment with antibiotic residues presents an ecological hazard, potentially giving rise to resistant bacteria that could endanger public health.

Causes of Antibiotic Residues in Milk.

The presence of antibiotic residues in milk can be attributed to various factors related to the therapeutic use and management of antibiotics. Indiscriminate usage of antibiotics in the treatment of infectious diseases, failure to follow instructions on antibiotic labels, concentrations, or conditions, and inadequate maintenance of withdrawal times can lead to higher concentrations of antibiotic residues in milk. Additionally, improper cleaning of equipment contaminated with antibiotics, improper disposal of antibiotic containers, and the impaired metabolic process of antibiotics in diseased animals can also lead to higher risks of antibiotic residues.

Impact of antibiotic residues on dairy products formulation

Antibiotic residues in milk used for fermented dairy products can affect technological methods, leading to lower product quality and potential economic implications for the dairy industry. The presence of antibiotic residues in milk inhibits the development of lactic acid bacteria, thereby delaying acid production. Similarly, in the cheese-making process, acid development is very important as it accelerates the activity of enzyme rennet and speeds up the coagulation process. Additionally, the presence of antibiotic residues in milk and inadequate pH levels can promote the growth of spoilage organisms such as Clostridia and yeasts, further affecting the quality of the final products.

Health Risks and Concerns

The existence of antibiotic residues in milk can present a significant risk to human health. Regulatory authorities establish Maximum Residue Limit (MRL) values for antibiotics, which are determined based on the Acceptable Daily Intake (ADI). The presence of antibiotic residues can potentially lead to various toxic effects in humans inclu carcinogenicity, allergies, mutagenicity, nephropathy, anaphylactic shock, reproductive disorders, bone marrow toxicity, and even

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Published 12.06.2023

hepatotoxicity. The hazards associated with antibiotic residues can be classified into two categories based on the duration of exposure and the time it takes for health effects to manifest: direct short-term hazards and indirect long-term hazards.

Several international organizations, including the World Health Organization (WHO), Codex Alimentarius Commission (CAC), and Food and Agricultural Organization (FAO) play a crucial role in regulating the use of drugs in animal production, specifically to addressing the issue of antimicrobial residues in animal-derived foods such as milk and meat. These organizations have developed maximum residue Limits (MRLs) for livestock products, and regular monitoring, control, and surveillance programs are in place to minimize the risk to human health. Monitoring and preventing illegal antibiotic residues in milk is essential for public health. Adhering to withdrawal periods, maintaining hygiene, and implementing effective management practices can reduce residue levels. Regulatory standards and strong management are crucial for ensuring milk safety.

Detection and Regulation of Antibiotic Residues

Various analytical techniques have been developed to detect drug residues in milk, categorized as screening tests and confirmatory tests. Screening methods, such as thin-layer chromatography and microbial inhibition tests, are qualitative in nature and primarily used for the initial detection of residues. On the other hand, confirmatory methods are more expensive, time-consuming, and require trained personnel. Examples of confirmatory methods include Liquid Chromatography (LC) coupled with detectors like mass spectrometry (MS) and UV, as well as High-Performance Liquid Chromatography (HPLC) and Capillary Electrophoresis (CE).

In order to address the issue of antibiotic residues in milk, it is crucial to raise public awareness through effective activities organized by experts and organizations in the field. To effectively control antibiotic residues in milk, it is crucial to develop highly sensitive detection tools to minimize false negatives and employ appropriate confirmation and quantification methods to reduce the risk of false positives. Any milk samples that exceed the maximum residue limit (MRL) should be promptly discarded. Regular monitoring and surveillance policies at a national level should be implemented to ensure that the levels or concentrations of antibiotic residues in milk are regularly monitored. Additionally, exploring herbal sources of medicines as an alternative option for treating diseases could be considered.

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Published 12.06.2023

Conclusion

The presence of antibiotic residues in milk is a significant concern due to the indiscriminate use of antibiotics in animals and the potential health risks associated with consuming such residues. These residues can lead to allergic reactions, toxic effects, and the development of antibiotic-resistant bacteria in humans. Raising public awareness, developing sensitive detection tools, and implementing effective monitoring and surveillance programs are crucial for addressing this issue and ensuring the safety of milk for human consumption.

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Published **12.06.2023**